ASSESSMENT OF ECONOMIC IMPACTS FOR THE WATER ALLOCATION FORMULA ENVIRONMENTAL IMPACT STATEMENTS

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Abstract. This paper describes the economic evaluations conducted for the Draft Environmental Impact Statements (EIS's) prepared in conjunction with the development of Water Allocation Formulas for the Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) River Basins. The EIS process requires that significant impacts to the human environment be identified and documented. Since the economies of the ACT and ACF basins are very dependent on the water resources contained in these basins, a considerable amount of economic analysis was undertaken for these EIS's.

INTRODUCTION

The primary purpose of the economic analysis is to determine if the implementation of water allocation formulas will result in significant economic impacts to these basins. Because actual allocation formulas had not been determined for the draft EIS's, a range of flow scenarios were evaluated as surrogates for the actual formulas. The economies of these areas are extremely large and complex. Thus, it is impossible to evaluate all potential economic impacts and only major impacts were considered. As a result of the evaluations conducted for the draft EIS's, no significant economic impacts were identified. However, once the actual allocation formulas have been agreed upon, they will be evaluated and the significance of any resulting economic impacts will be determined.

BACKGROUND

Two types of economic impacts were evaluated in the draft EIS's: direct impacts and regional impacts. Direct impacts are changes in the costs of producing goods and services that accrue to the nation as a whole. Direct economic impacts were evaluated for Municipal and Industrial (M&I) Water Supply, Agricultural Water Supply, Inland Navigation, Electric Power Generation, Boater Recreation and Urban Flood Control. The U.S. Army Corps of Engineers accomplished these direct evaluations, except for Agricultural Water Supply, which was prepared by the Natural Resources Conservation Service (NRCS).

The regional or indirect impacts occur when the direct economic impacts filter through the basin economies. Regional impacts were evaluated using the Economic Impact Forecasting System (EIFS). This computer model is a tool for evaluating regional economic impacts. It was originally developed to evaluate regional economic impacts related to Base Closure and Realignment (BRAC) activities. It is an inexpensive, well-tested economic impact screening tool that has the advantage of a built-in significance test known as the Rational Threshold Value. This feature allows the comparison of economic impacts from a proposed action, in terms of business sales volume, personal income and employment, with the normal fluctuations of the economy. Impacts that are within the normal fluctuations of the regional economy are not regarded as significant. When impacts occur that are greater than the normal fluctuations in the economy this is an indication that a more detailed evaluation is needed.

METHODS

Impacts are defined as the differences between the "no action" condition and the condition that would exist with a water allocation formula in place. Because the actual water allocation formulas are not available yet, evaluations were conducted for three alternative flow scenarios: high flow, moderate flow, and low flow. Economic impacts occur as a result of changes in some water variable such as "flow," "pool elevation," or "channel availability." Under each alternative flow scenario, the total volume of water remains the same; only the manner in which the flow is distributed changes. Each alternative flow scenario includes a set of assumptions related to project operations. For example, the "no action" condition includes existing operations for navigation windows, seasonal flood control and hydropower peaking at projects where those are current operational tasks. The high, moderate and low flow scenarios do not

include operations for navigation windows or hydropower peaking. In addition, the high flow scenario eliminates the use of seasonal flood control storage in the basins. These flow scenarios do not represent any particular proposed operational alternative, but rather a range of possible flow conditions based on the physical constraints of the system.

The measurement standard for economic impacts is consumer "willingness-to-pay." Economic analysis employs a long term planning horizon that considers historical river flows for the entire period of record. Because economic impacts occur at different times under different operating scenarios, the time/value of money must be taken into account to allow for meaningful comparisons. This is done by determining the present value of all monetary impacts at the base year of the study, using the current Federal discount rate, and then amortizing them over the study period. Thus, all economic values are stated in average annual dollars using a current price level.

DISCUSSION

Much of the data used in the economic analysis was developed by the ACT-ACF Comprehensive Basins Study (Comprehensive Study), which was conducted by the Mobile District, Corps of Engineers in partnership with the states of Alabama, Georgia and Florida. Some of the data developed for the study is still in draft form, however it has been used, because it is the most comprehensive, consistent data available. To conduct a quantitative economic analysis, a consistent data set is needed that relates an economic activity to water variables such as flow or lake-level. Where consistent data were unavailable, only qualitative analysis could be performed.

M&I Water Supply

M&I Water Supply was evaluated for 41 counties in the ACT basin and 59 counties in the ACF basin. Based on Comprehensive Study data, average M&I demand for the two basins was estimated to be 1,667 million gallons per day (MGD) in 1995. This includes 886 MGD for the ACT basin and 781 MGD for the ACF basin. By the year 2050, average M&I demand for the two basins is forecast to increase to 2,249 MGD, which includes 1,200 for the ACT basin and 1,049 for the ACF basin. Water Supply shortages were identified using HEC-5 flow data. The value of these shortages was determined by applying marginal price data from the Comprehensive Study.

Agricultural Water Supply

The U.S. Department of Agriculture, NRCS, evaluated agricultural Water Supply. They determined that surface water withdrawal from main stem rivers and reservoirs account for only a small portion of total agricultural water demand. As long as plants receive 75% to 80% of water needs during key growth stages, there is little or no reduction in yields and, therefore, little or no economic impact. In addition, many farms that use surface water also have access to ground water to offset shortages. Based on study findings, over 80% of surface water needs of the basins were supplied, and in the vast majority of cases shortages occurred less than 1% of the time. For some agricultural areas (e.g. the Flint River Basin), the ability to affect flows is very limited. This, in turn, limits the impacts that a water allocation formula can have on Agricultural Water Supply in these areas. Overall, NRCS identified no impacts to Agricultural Water Supply.

Inland Navigation

During 1996, a total of 710,000 tons of commerce moved on the ACT waterway and 567,000 tons moved on the ACF waterway. Based on Comprehensive Study data commerce is forecast to increase to 2,290,000 tons on the ACT waterway and 1,043,000 on the ACF waterway by the year 2050. These are average annual growth rates of 1.65% and .98% for each waterway respectively. Commerce on the ACT is mainly forest products, sand & gravel and petroleum products. Commerce on the ACF is sand & gravel, agricultural chemicals and petroleum products. Channel availability was determined by HEC-5 output. Transportation rates were estimated using the Reebie Transportation Cost Computer Model. Changes in channel availability between the "no action" condition and the flow scenario results in increased light loading of barges and the use of alternative transportation modes. Direct economic impacts are the increased costs of moving goods to market.

Electric Power Generation

Using Comprehensive Study Data, net annual energy demand for the basins was determined to be 80.7 million megawatt hours (MWhrs) in 1995. This included 48.2 million MWhrs for the ACT basin and 32.5 million MWhrs for the ACF basin. By the year 2010 demand is forecast to increase to 112.3 million MWhrs, including 67.1 million MWhrs for the ACT basin and 45.2 million MWhrs for the ACF basin. In 1995 total generating capacity for the ACT basin was 8,326 megawatts (MW), which included 2,307 MW of hydropower generating capacity. In that same year, total generating capacity for the ACF basin was 6,657 MW, including 652 MW of hydropower generating capacity. Energy production for each scenario was estimated from HEC-5 output. Energy values were determined using the Prosym hydropower computer model. These are based on changes in power production costs between the "no action" condition and the flow scenarios. It is assumed that changes in hydropower affect other system resources. The direct

economic impacts are the resulting net changes in electric power production costs that are incurred by the power system.

Boater Recreation

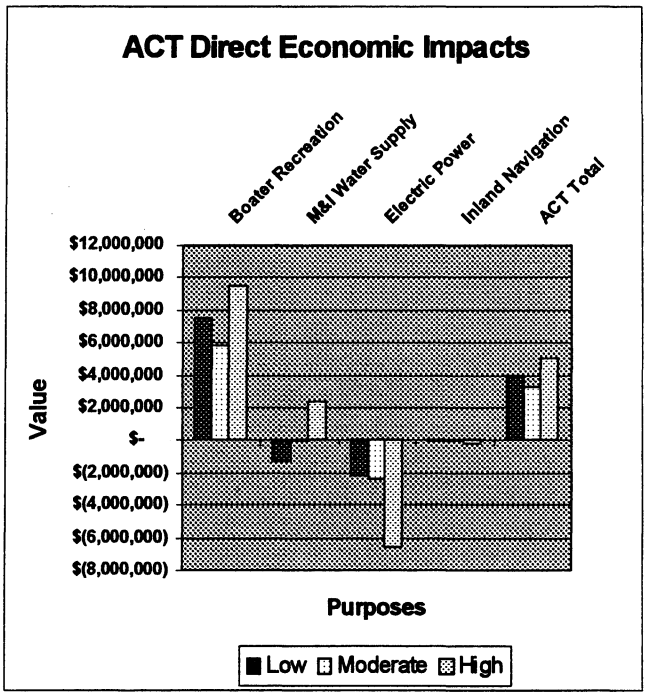
Impacts to boater recreation were evaluated for 10 reservoirs in the ACT basin, as well as 5 reservoirs and one river segment in the ACF basin. Recreation demand was determined using a two-phase survey of registered boaters from the states of Alabama, Georgia and Florida. A total of 2,000 surveys were completed for the phase one survey, which determined the level of recreation use at the reservoirs. A total of 600 more detailed surveys were conducted for phase two. Detailed analysis was conducted for six "impact" projects. The results of this detailed analysis were then extrapolated to the other projects in the basins based on project similarities. The surveys related changes in water levels to changes in recreation visitation. Direct recreation values were estimated from the survey for each project, based on trip expenditures. These values were applied to estimated changes in recreation visitation that occurred under the various flow scenarios. Based on the survey, there are about 2.6 million recreation boater trips annually in the ACT basin and 2.2 million in the ACF basin. The most frequent recreation activities are fishing, recreation boating, swimming and picnicking.

Flood Control

The only flood control measure included in the flow scenarios was the elimination of seasonal flood control storage for the high flow option. No quantitative evaluation of the seasonal flood control was conducted, however it is believed that impacts would be minimal. A preliminary analysis of flood control storage was conducted separately from the flow scenario analysis for the other direct economic elements to determine what impact elimination of flood control storage would have downstream of three key projects: West Point, Buford and Allatoona. If flood control storage was eliminated, property that currently enjoys flood protection could be subject to more frequent flooding. The resulting economic impact is the net increase in flood damage caused by the reduction or elimination of flood control storage.

CONCLUSIONS

The graphs provided in this section summarize the results of the economic analysis. In the Alabama-Coosa-Tallapoosa Basin all three of the flow scenarios have positive impacts to recreation, compared to the "no action" condition. This is because during normal and above normal water years, lake-levels in the basin tend to be higher under each of the flow alternatives that they would be under "no action." As would be expected, M&I Water Supply experiences positive



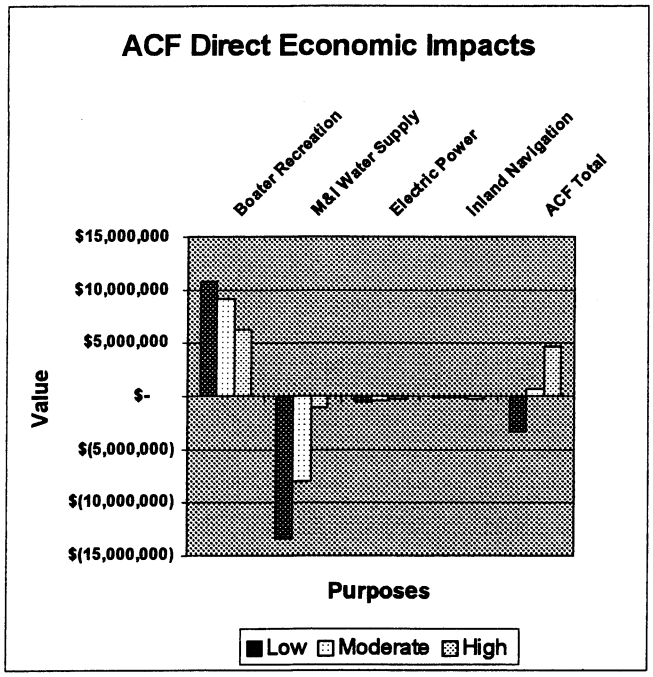
impacts for the high flow scenario, negative impacts for the low flow scenario and little impact for the moderate flow scenario.

Hydropower impacts are negative for all scenarios, due to the fact that the projects are being operated as baseload plants under the three alternative flow scenarios, rather than for peaking power as they are under the "no action" condition. Peaking power has a greater economic value than baseload power, because it is used during times of high demand. Inland Navigation is impacted very little by any of the flow scenarios. Agricultural Water Supply is not displayed in the graph because, as was discussed previously, no impacts to this use were identified.

Changes in flood control storage were not included in any of the alternative flow scenarios, except for the relatively minor impacts from elimination of seasonal drawdowns. Thus, flood control is also not displayed in the graph. Impacts from seasonal drawdowns are expected to be small, however no quantitative evaluation of seasonal drawdowns was conducted. Overall, the impacts of the three alternative flow scenarios are somewhat positive, when compared to the "no-action" condition, with the "high flow" scenario having the greatest positive economic impact.

In the Apalachicola-Chattahoochee-Flint Basin recreation is impacted positively by all three alternative flow scenarios, when compared to the "no-action" condition. Water supply is impacted in a negative way by all of the flow scenarios. As would be expected, the "low flow" scenario had the greatest negative impact, while the "high flow" scenario has

only a minor negative impact. In general, there is a greater impact to water supply in the ACF basin than in the ACT basin.



The impacts to electric power generation and inland navigation are relatively minor under all scenarios. Also, agricultural water supply is not impacted by any of the flow alternatives and the impact of eliminating seasonal flood control drawdowns is not evaluated quantitatively. Overall the "low flow" scenario has a somewhat negative impact, when compared to the "no action' condition, while the moderate flow scenario has very little impact and the "high flow" scenario has a somewhat positive impact.

The basin wide regional economic impacts follow the same pattern as the direct impacts. For the ACT basin regional economic impacts to business sales volume vary from a positive $11 million under the moderate flow scenario to a positive $16 million for the high flow scenario. For the ACF basin regional economic impacts to business sales volume vary from a negative $13 million under the low flow scenario, to a positive $18 million under the high flow scenario. Personal income and employment follow the same patterns as business sales volume, however the impacts are much less. None of the regional impacts fall outside the normal fluctuations of the regional economies and therefore, they are not deemed "significant." Indeed, the business sales volume and personal income for each of these basins is in the billions of dollars and the annual fluctuations in these variables are in the hundreds of millions of dollars.

Regional impacts were also evaluated for a few local areas that had in excess of $500,000 in direct impacts, to see if these impacts would be significant to the smaller local areas. For example, the counties surrounding Lake Martin and Lake Lanier were evaluated in this manner for recreation. These impacts were determined to be far less than the normal fluctuations of the local economy and therefore, were not deemed significant.

A separate analysis of flood control was conducted to determine the downstream impact elimination of flood control storage would have at three key projects: West Point, Buford and Allatoona. At West Point, elimination of flood control storage would increase average annual flood damages by over $5 million. At Buford average annual flood damages would be increased by about $51 million. At Allatoona elimination flood control storage would increase average annual flood damages by about $4.8 million.

RECOMMENDATIONS

The economic evaluation tools are now in place to evaluate allocation formulas. This final step in the evaluation process will be accomplished, once the allocation formulas have been determined. The evaluation tools have been tested and appear to give reasonable, logical results. This is an important consideration because of the short timeframe available to prepare final EIS's once the formulas are adopted.

ACKNOWLEDGMENTS

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